

Amendments to the Claims

Claim 1 (currently amended): An interleaver comprising:

a birefringent element device assembly comprising at least one spatial birefringent element device, the birefringent element device assembly providing two interim output components;

a reflector configured to direct the two interim output components from the birefringent element device assembly back through the birefringent element device assembly;

wherein the spatial birefringent element device consists of:

a polarization beam splitter to first separate an optical beam into two orthogonally polarized components[[],];

a first polarization rotator and a first reflector to control the propagation of one of the two orthogonally polarized components;

a second polarization rotator and a second reflector to control the propagation of the other one of the two orthogonally polarized components;

wherein the first polarization rotator, the first reflector, the second polarization rotator, the second reflector and the polarization beam splitter are configured such that each of the two orthogonally polarized components travels along separate paths of different optical path lengths such that and when the two orthogonally polarized components recombine at the output of the spatial birefringent device, a birefringent effect phase delay between the two orthogonally polarized components is achieved.

Claim 2 (currently amended): The interleaver as recited in claim 1, further comprising a polarization rotator configured to align the two interim output components prior to the two components being transmitted back through the birefringent element device assembly such that approximately zero dispersion is obtained in an output of the interleaver.

Claims 3-6 (canceled)

Claim 7 (currently amended): The interleaver as recited in claim 1, wherein the birefringent element device assembly comprises a plurality of spatial birefringent elements devices.

Claim 8 (currently amended): The interleaver as recited in claim 1, wherein the birefringent element device assembly comprises a first spatial birefringent element device having an equivalent angular orientation of φ_1 , a second spatial birefringent element device having an equivalent angular orientation of φ_2 and a third spatial birefringent element device having an equivalent angular orientation of φ_3 ;

wherein an order of the first spatial birefringent element device, second spatial birefringent element device, and third spatial birefringent element device is selected from the group consisting of:

first spatial birefringent element device, second spatial birefringent element device, third spatial birefringent element device;

third spatial birefringent element device, second spatial birefringent element device, first spatial birefringent element device; and

wherein the equivalent angular orientations are with respect to an equivalent polarization direction of light entering the spatial birefringent element device assembly.

Claim 9 (currently amended): The interleaver as recited in claim 1, wherein the birefringent element device assembly comprises:

a first spatial birefringent element device having an equivalent angular orientation of 45° and having a phase delay of Γ ;

a second spatial birefringent element device having an equivalent angular orientation of -21° and having a phase delay of 2Γ ; and

a third spatial birefringent element device having an equivalent angular orientation of 7° and having a phase delay of 2Γ .

Claim 10 (currently amended): The interleaver as recited in claim 1, wherein the birefringent element device assembly comprises two spatial birefringent elements devices.

Claim 11 (currently amended): The interleaver as recited in claim 1, wherein the birefringent element device assembly comprises:

a first spatial birefringent element device having an equivalent angular orientation of 45° and having a phase delay of Γ ; and

a second spatial birefringent element device having an equivalent angular orientation of -21° and having a phase delay of 2Γ .

Claim 12 (currently amended): The interleaver as recited in claim 1, wherein the birefringent element device assembly and the reflector are configured so as to facilitate interleaving of a plurality of input light beams simultaneously.

Claim 13 (currently amended): The interleaver as recited in claim 1, wherein each spatial birefringent element defines two light paths two separate light paths are defined for the two orthogonally polarized components, respectively, within the spatial birefringent device, each light path having a different optical path length and wherein a difference in optical path length between the two paths is provided by a material having an index of refraction greater than one unity which that is disposed within at least a portion of one of the first and second paths.

Claim 14 (currently amended): The interleaver as recited in claim 1, wherein each spatial birefringent element defines two light paths two separate light paths are defined for the two orthogonally polarized components, respectively, within the spatial birefringent device and wherein an index of refraction is different for at least a portion of at least one of the two light paths so as to cause the two light paths to have different optical path lengths.

Claim 15 (previously presented): The interleaver as recited in claim 1, wherein the interleaver channels have spacing which is tunable.

Claim 16 (currently amended): A birefringent element device assembly comprising:
at least one spatial birefringent element device; and
a polarization rotator for controlling an equivalent angle of the birefringent element device assembly;

wherein the spatial birefringent element device consists of:

a polarization beam splitter to first separate an optical beam into two orthogonally polarized components[[,]];

a first polarization rotator and a first reflector to control the propagation of one of the two orthogonally polarized components;

a second polarization rotator and a second reflector to control the propagation of the other one of the two orthogonally polarized components;

wherein the first polarization rotator, the first reflector, the second polarization rotator, the second reflector, and the polarization beam splitter are configured such that each of the two orthogonally polarized components travels along separate paths of different optical path lengths such that and when the two orthogonally polarized components recombine at the output of the spatial birefringent element device, a birefringent effect phase delay between the two orthogonally polarized components is achieved.

Claim 17 (previously canceled)

Claim 18 (currently amended): A method for interleaving, the method comprising:
transmitting light through a birefringent element device assembly comprised of at least one spatial birefringent element device, the birefringent element device assembly separating the light into first and second interim output components;

making the two interim output components polarized along desired polarization directions; and

transmitting the first and second interim output components back through the birefringent element device assembly;

wherein the spatial birefringent element device consists of:

a polarization beam splitter to ~~first~~ separate an optical beam into two orthogonally polarized components[[],];

a first polarization rotator and a first reflector to control the propagation of one of the two orthogonally polarized components;

a second polarization rotator and a second reflector to control the propagation of the other one of the two orthogonally polarized components;

wherein the first polarization rotator, the first reflector, the second polarization rotator, the second reflector, and the polarization beam splitter are configured such that each of the two orthogonally polarized components travels along separate paths of different optical path lengths such that and when the two orthogonally polarized components recombine at the output of the spatial birefringent element device, a birefringent effect phase delay between the two orthogonally polarized components is achieved.

Claim 19 (canceled)

Claim 20 (currently amended): An interleaver comprising:

a birefringent element device assembly comprising at least one spatial birefringent element device;

a reflector configured to direct an interim output of the birefringent element device assembly back through the birefringent element device assembly;

wherein the spatial birefringent element device consists of:

a polarization beam splitter to first separate an optical beam into two orthogonally polarized components[.];

a first polarization rotator and a first reflector to control the propagation of one of the two orthogonally polarized components;

a second polarization rotator and a second reflector to control the propagation of the other one of the two orthogonally polarized components;

wherein the first polarization rotator, the first reflector, the second polarization rotator, the second reflector and the polarization beam splitter are configured such that each of the two orthogonally polarized components travels along separate paths of different optical path lengths such that and when the two orthogonally polarized components recombine at the output of the spatial birefringent element device, a birefringent effect phase delay between the two orthogonally polarized components is achieved[.]; and

wherein phase delays and birefringent element orientations for of the spatial birefringent devices in the birefringent element device assembly are selected from the table:

Table I

<u>First Stage Phase Delays</u>	<u>First Stage Orientations</u>	<u>Second Stage Phase Delays</u>	<u>Second Stage Orientations</u>
$\Gamma + 2m_1 \pi$, $2\Gamma + 2m_2 \pi$, $2\Gamma + 2m_3 \pi$	$\varphi_1, \varphi_2, \varphi_3$	$2\Gamma' + 2k_3 \pi$, $2\Gamma' + 2k_2 \pi$, $\Gamma' + 2k_1 \pi$	$90^\circ \pm \varphi_3, 90^\circ \pm \varphi_2, 90^\circ \pm \varphi_1$ (parallel component) $\pm \varphi_3, \pm \varphi_2, \pm \varphi_1$ (orthogonal component) where $\Gamma - \Gamma' = 2l\pi$
$\Gamma + 2m_1 \pi$, $2\Gamma + 2m_2 \pi$, $2\Gamma + 2m_3 \pi$	$\varphi_1, \varphi_2, \varphi_3$	$2\Gamma' + 2k_3 \pi$, $2\Gamma' + 2k_2 \pi$, $\Gamma' + 2k_1 \pi$	$90^\circ \pm \varphi_3, 90^\circ \pm \varphi_2, 90^\circ \pm \varphi_1$ (parallel component) $\pm \varphi_3, \pm \varphi_2, \pm \varphi_1$ (orthogonal component) where $\Gamma - \Gamma' = (2l + 1)\pi$
$2\Gamma + 2m_3 \pi$, $2\Gamma + 2m_2 \pi$, $\Gamma + 2m_1 \pi$	$\varphi_3, \varphi_2, \varphi_1$	$\Gamma' + 2k_1 \pi$, $2\Gamma' + 2k_2 \pi$, $2\Gamma' + 2k_3 \pi$	$90^\circ \pm \varphi_1, 90^\circ \pm \varphi_2, 90^\circ \pm \varphi_3$ (parallel component) $\pm \varphi_1, \pm \varphi_2, \pm \varphi_3$ (orthogonal component) where $\Gamma - \Gamma' = 2l\pi$
$2\Gamma + 2m_3 \pi$, $2\Gamma + 2m_2 \pi$, $\Gamma + 2m_1 \pi$	$\varphi_3, \varphi_2, \varphi_1$	$\Gamma' + 2k_1 \pi$, $2\Gamma' + 2k_2 \pi$, $2\Gamma' + 2k_3 \pi$	$\pm \varphi_1, \pm \varphi_2, \pm \varphi_3$ (parallel component) $90^\circ \pm \varphi_1, 90^\circ \pm \varphi_2, 90^\circ \pm \varphi_3$ (orthogonal component) where $\Gamma - \Gamma' = (2l + 1)\pi$

Wherein $m_1, m_2, m_3, k_1, k_2, k_3$ and l are integers $(0, \pm 1, \pm 2, \dots)$.

Claim 21 (currently amended): An interleaver comprising:

at least one birefringent element device assembly, each birefringent element device assembly comprising at least one spatial birefringent element device; and

a reflector configured to direct light, which has passed through each of the birefringent element device assemblies sequentially, back through each of the birefringent element device assemblies sequentially in a reverse direction;

wherein the spatial birefringent element device consists of:

a polarization beam splitter to first separate an optical beam into two orthogonally polarized components[[],];

a first polarization rotator and a first reflector to control the propagation of one of the two orthogonally polarized components;

a second polarization rotator and a second reflector to control the propagation of the other one of the two orthogonally polarized components;

wherein the first polarization rotator, the first reflector, the second polarization rotator, and the second reflector, and the polarization beam splitter are configured such that each of the two orthogonally polarized components travels along separate paths of different optical path lengths such that and when the two orthogonally polarized components recombine at the output of the spatial birefringent element device, a birefringent effect phase delay between the two orthogonally polarized components is achieved.